

Committee on Resources,

Subcommittee on Fisheries Conservation, Wildlife & Oceans

[fisheries](#) - - Rep. Wayne Gilchrest, Chairman

U.S. House of Representatives, Washington, D.C. 20515-6232 - - (202) 226-0200

Witness Statement

TESTIMONY OF SCOTT B. GUDS
ACTING UNDER SECRETARY FOR OCEANS AND ATMOSPHERE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
DEPARTMENT OF COMMERCE
BEFORE THE
SUBCOMMITTEE ON FISHERIES CONSERVATION, WILDLIFE AND OCEANS
COMMITTEE ON RESOURCES
U.S. HOUSE OF REPRESENTATIVES
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Thank you, Mr. Chairman and Members of the Subcommittee, for the opportunity to appear before you today to testify on the effectiveness of the Hydrographic Services Improvement Act and the navigation information services that this Act authorizes. Promoting safe navigation for the U.S. Marine Transportation System is one of the critical missions provided by the Department of Commerce's National Oceanic and Atmospheric Administration. We are very appreciative of your continued support and interest in examining the progress we have made in modernizing NOAA navigation programs since the enactment of the 1998 Act. The Department testified before this Subcommittee on this subject in 1997, and it was my privilege to testify on NOAA's navigation services in 2000. I would now like to update you on some of our successes and program issues, and conclude by highlighting some changes we would like to see in a new Hydrographic Services Improvement Act. In addition, we will provide some preliminary comments on the Committee's proposed draft reauthorization measure provided to us with the invitation letter for this hearing. The Department of Commerce is also preparing a draft legislative proposal for transmittal to the Congress. It is our hope that reauthorization will allow NOAA to make even greater strides in providing the timely and accurate information so necessary for safe and environmentally sound marine transportation, efficient maritime commerce and ultimately our Nation's economic prosperity in the global marketplace.

The Marine Transportation System Initiative: NOAA's role

Since our Nation's founding, maritime trade has been vital to economic prosperity. Today, more than 95 percent of U.S. foreign trade moves by sea. In 1998, about 2.4 billion tons of cargo moved on our waterways and through our ports; by 2020, trade is conservatively projected to double, with the largest increase seen in container shipping. The length, width, and draft of commercial vessels have grown dramatically over the last 50 years, pushing the limits of many ports and posing significant safety concerns and environmental risk as nearly half of all goods transported are oil or other hazardous materials. Growth in ferry, cruise line, and recreational boating also contributes to increased congestion on our waterways. Ensuring safe and efficient port operations is vital to maintaining the competitiveness of the U.S. port industry and U.S. exports. One key to reducing risk is to invest in the national information infrastructure that supports the maritime movement of goods and people.

In 1998, Congress directed Federal agencies to assess the state of the U.S. Marine Transportation System (MTS) and develop a vision for modernizing the system. This was a first step toward developing a 21st century transportation system that addresses the future of the system's safety, security, competitiveness, infrastructure shortages, and environmental health. Federal agencies and the private sector have partnered to continue to support the MTS initiative by raising awareness of MTS issues. In June, NOAA and its partners held the first-ever national event promoting the MTS on the National Mall.

NOAA supports the MTS with a variety of navigation and environmental services. NOAA's programs authorized by the Coast and Geodetic Survey Act of 1947 and the 1998 Hydrographic Services Improvement Act -- Mapping and Charting, Survey Backlog, Geodesy, and Tide and Current Data -- form the backbone of the MTS information infrastructure. In addition to promoting safe and efficient maritime commerce with its navigation services, NOAA issues marine weather forecasts, conducts satellite-aided search and rescue tracking with the U.S. Coast Guard and other partners, and facilitates sound port development. NOAA also supports an environmentally friendly MTS by conducting waterway risk assessments to aid port planning, carrying out spill preparedness and response activities, and promoting fisheries management and habitat restoration. These activities form a comprehensive and effective program supporting the future of the MTS.

Modernization of NOAA's Services

Since President Thomas Jefferson established the Survey of the Coast in 1807, mariners have depended on federally-supported nautical charts, coastal water level observations systems, and a geodetic positioning reference system to navigate safely. NOAA charts are developed from NOAA's hydrographic and shoreline surveys, tide and current measurements, and national geodetic and geographic positioning data, as well as information from many other sources. NOAA continues to provide these traditional and fundamental services, but we now seek to deliver them in ever more innovative ways to meet user demands for accuracy, timeliness and electronic delivery. For example, we have recently begun a prototype release of electronic navigational charts via the Internet. We are exploring new capabilities for improving the accuracy of Global Positioning System technology, and we are adding forecasts to our real-time "nowcasts" of water levels to increase the efficiency of vessel movement and cargo loads. Demonstration projects have shown that these programs can provide the accurate data necessary for determining precise under-keel and overhead/bridge clearances and can support low visibility docking, allowing commercial vessels to navigate more safely and to load and move cargo efficiently in and out of depth-limited harbors. NOAA's integrated suite of surveying, charting, water level, and positioning services is capable of increasing the efficient movement of goods, thereby reducing vessel fuel consumption and port pollution, supporting just-in-time delivery of goods and enhancing the competitiveness of U.S. exports. NOAA's navigation services also reduce the risk of marine accidents and resulting environmental damage, ensuring that tourism, fishing and other ocean- and coastal-dependent industries continue to prosper. If accidents do occur, NOAA can provide the necessary support to ensure a rapid science-based response and eventual restoration of damaged coastal resources.

User communities

NOAA's navigation services are being utilized by an increasingly diverse group of users. In addition to the mariner, other end users of NOAA products include port authorities, vessel traffic systems, environmental scientists and researchers, emergency planners and coastal zone managers. The navigation programs have undertaken a deliberate and consistent effort to recognize these new users, to solicit all user input and to enlist the support of the private sector and academia in data collection, product design and research and

development. Successes in our efforts to implement digital charting databases and develop useful new products could not have been accomplished without our private sector and academic partners.

Another success is NOAA's regional approach to working directly with the navigation community. This core group, which includes commercial mariners, marine pilots, the Coast Guard and Army Corps of Engineers, among others, has fully participated in developing NOAA's modernization strategy and prioritization of services. Throughout NOAA's navigation services -- hydrography, charting, positioning and water level data -- the basic strategy has been to make investments where they will yield the greatest benefit to the public and the mariner. Typically this has meant first focusing efforts and implementing advanced technologies in and around the Nation's busiest ports and in areas where the nature of the cargo or the uncertainty of seafloor characteristics present the highest risk of harm or accident. NOAA has effectively engaged the navigation community on a regional basis in order to track and address critical needs. Recent investments in the navigation programs have renewed this user group's confidence that NOAA will deliver the accurate and up-to-date products on which safe and efficient U.S. marine transportation depends. NOAA's long-standing relationships with other maritime interests and organizations, including U.S. Power Squadrons and Coast Guard Auxiliaries, are also very beneficial. These groups often serve as "eyes and ears" for the agency regarding significant changes affecting hydrographic services and nautical charts on local waters. This volunteer activity provides the Nation with a valuable service, one which NOAA would like to see reflected in legislation to reauthorize the Hydrographic Services Improvement Act. Encouraging and promoting this important cooperative charting effort, with NOAA's discretion to accept and define the terms of such volunteer activities, would assist the agency tremendously.

Hydrographic Surveying

Reducing the critical hydrographic survey backlog is one NOAA priority that has received significant attention in recent years. Responsible for charting the 3.4 million square nautical miles (snm) of the U.S. Exclusive Economic Zone (EEZ), NOAA undertook a realistic assessment of hydrographic surveying needs and capability in 1994. Nearly 500,000 snm of that area -- about 15 percent of the EEZ - were determined to be navigationally significant due to the greatest threat of natural and manmade hazards to marine navigation. Given its limited ability to address this huge responsibility, NOAA identified 43,000 snm - about 1.3 percent of the EEZ - as being the most "critical" to survey in terms of vessel usage and safety issues. Critical survey areas are waterways with high commercial traffic volumes, oil or hazardous material transport, compelling requests from users, and transiting vessels with low underkeel clearance over the seafloor. Much of the survey backlog is in Alaska, where large areas have never been surveyed, earthquakes can cause significant change, and high-occupancy cruise ships are venturing into the uncharted waters at the feet of receding glaciers.

In 1994, NOAA estimated that it would take 30 years to complete the 43,000 snm critical survey backlog. When we testified before the Subcommittee in 1997, the backlog stood at approximately 39,000 snm. Now at the end of Fiscal Year 2001, I am pleased to report that the backlog has been reduced to 30,000 snm and the estimate for completion at current funding levels is under 20 years and dropping with contractor acquisition miles and the anticipated production of the refurbished NOAA Ship FAIRWEATHER. NOAA had extremely successful field seasons in FY00 and FY01, including several notable obstruction findings. For example, while investigating a shoal bordering the Boston North Channel with side scan and multi-beam sonar, the NOAA Ship RUDE located the wreck of a steel barge rising ten feet off the seafloor just inside the channel limits. This was an important find, as a tanker carrying highly explosive Liquified Natural Gas with a vessel draft deeper than the barge was due to transit the channel in a matter of days.

NOAA has not achieved this significant reduction in survey miles and time by itself. In 2001, NOAA contracted out over sixty-five percent of its surveying resources, and our contractor relationships are very strong. The contractors are gaining in experience, and their data acquisition miles are increasing. Given the magnitude of survey requirements, NOAA promotes using a balanced mix of resources to acquire survey data. While operating in-house vessels is necessary to maintain the expertise to ensure accurate nautical charts and assume responsibility for contract data, utilizing the capabilities that the private sector brings to bear on this problem makes good sense. Details on our surveying efforts are shown in Table A.

With a plan in place to successfully address the critical survey backlog, NOAA would like to renew its focus on the Nation's other navigationally significant areas of responsibility. Critical areas in need of periodic re-survey due to naturally occurring changes such as silting, storms and earthquakes, increased vessel size using the waterway, and wrecks or changes in navigational use must be placed on a schedule to avoid a recurrence of the backlog situation. The U.S. Coast Guard, marine pilots and port authorities have also identified additional areas as potentially dangerous to safe navigation and in need of survey. NOAA is able to address some of these unanticipated requests on a quick response basis following hurricanes or other disasters. For example, NOAA surveyed in Puget Sound for navigation hazards following the February 2001 earthquake near Seattle. For the most part, however, the remaining priority areas will take over 300 years to survey at the current level of effort. Limiting NOAA's efforts to critical backlog alone does not fully meet the needs of commercial mariners, recreational boaters, our federal partners, or other users, for whom high-accuracy navigation information is essential to operate safely in all nearshore waters. These stakeholders are depending on NOAA to produce new digital hydrographic data to populate the Electronic Navigational Chart and other innovative products that far exceed the paper nautical chart in precision and capability. NOAA's modern survey techniques using the Global Positioning System for positioning accuracy are a significant improvement over older data collection methods.

Table A

FY	NOAA Vessel Production (snm)	NOAA Cost * (\$M)	Contract Production (snm)	Contract Cost (\$M)	Critical Survey Backlog (from 43,000 snm)
1994	1522	18.0**	61	1.2	41,417
1995	1345	17.8	3	.1	40,069
1996	1297	12.4	15	.1	38,757
1997	1292	13.2	13	.2	37,452
1998	997	13.1	421	8.9	36,034
1999	1080	12.7	869	20.4	34,085
2000	1081	12.7	476***	15.6	32,529
2001 (est)	1465	12.7	1345****	18.0	29,718

*These figures do not include a number of indirect costs, including actuarial costs of Federal liability and much of the Federal retirement and benefits. Therefore, these costs may not be comparable to the Contract Cost column.

**Actual NOAA vessel costs for hydrographic surveying not broken out separately in FY 1994.

*** Production decrease for contracts due to less funding available, and higher percentage of work in high-difficulty areas in Alaska, which is more expensive than Gulf of Mexico.

**** Includes higher percentage of contract work in deep water areas, which requires fewer survey lines and item investigations to achieve the necessary coverage.

Maintaining federal expertise in the management of hydrographic surveying has been and will continue to be key to fulfilling NOAA's legal responsibilities as the Nation's hydrographic and charting office. NOAA can maintain that expertise with its hydrographic survey vessels and a core group of government hydrographers and still contract with the private sector for survey data. As I mentioned earlier, NOAA's plan is to employ a mix of assets to acquire hydrographic survey data; that is, to balance NOAA's capabilities with private sector contracting and vessel leases for survey data. In-house expertise enables NOAA to confidently accept data from outside sources, assume liability for contractor data it accepts, and provide competent oversight of all aspects of private surveying practices for these large multi-million dollar contracts or chartered vessels. NOAA takes its responsibilities for assuring the accuracy of the data on its charts very seriously.

To comment on the effectiveness of the Hydrographic Services Improvement Act on this program, the outlook is very good for NOAA to continue to achieve efficiencies in its hydrographic surveying responsibilities. A mix of assets - in-house and contract -- has proven highly successful to date, and we hope to see continued support for this approach in a reauthorized Hydrographic Services Improvement Act. At the request of Congressman David Vitter (R-LA) and the Office of Management and Budget, NOAA is now exploring a vessel lease option to add survey capacity and flexibility to reducing the hydrographic survey backlog. We have entered into a contract with the auditing firm KPMG to perform an independent cost analysis of NOAA's hydrographic surveying through NOAA vessels, contracting and a vessel lease. KPMG's report is due at the end of September. The purpose is to enable NOAA to most effectively deploy its resources and highlight the most appropriate use of survey options based on geography and risk mitigation. For example, some survey areas strewn with rocks and pinnacles pose complex challenges. It therefore may be more efficient to utilize the experience and size of the NOAA ships RAINIER or FAIRWEATHER in these dynamic regions where it is difficult to specify deliverables and to task contractors with more well-defined seafloor areas on which they have more experience.

NOAA's partners look to us for hydrographic leadership and research into new survey technologies; developing efficiencies with multi-beam and side scan sonar equipment on NOAA survey vessels improves the effectiveness of both in-house and contract operations. NOAA also demonstrates expertise by developing software integration and state-of-the art technology with industry and academia. Advances in NOAA's hydrographic surveying program will fuel this research and development, provide more opportunities and options for contract survey work to speed reduction of the critical backlog, and begin to address the remaining navigationally significant areas in need of survey. The 1999 assessment of the U.S. Marine Transportation System echoes this three-part goal. It recommends that NOAA accelerate backlog reduction, make progress on surveys for the rest of the Exclusive Economic Zone, and incorporate advanced technologies into hydrographic surveying to improve data collection and enhance the Electronic Navigational Chart for safe navigation. However, the language in the draft reauthorization measure provided with the letter of invitation limits NOAA's authority to operate its hydrographic ships without multi-beam equipment after October 1, 2001. We fully support the Subcommittee's intent that NOAA use modern equipment, but submit that the provision is overly specific. For example, it would prohibit NOAA from operating subsequent and more modern generations of equipment as those become available. In some cases, multi-beam systems on NOAA's smaller vessels might be inappropriate. NOAA's goal is to procure multi-

beam systems to modernize all larger NOAA survey vessels, but this effort will take funding and time to achieve beyond the deadline specified; furthermore, we believe this limitation on authority is counterproductive to using all available assets to reduce the survey backlog.

Our partnership with the University of New Hampshire Center for Coastal and Ocean Mapping and Joint Hydrographic Center continues NOAA's commitment to productivity improvements by promoting research and development, creating new markets and improving the training and capability of U.S. hydrographers. The Joint Hydrographic Center has been extremely successful, exceeding all expectations in its first two years of operations. Both the educational and research programs are well established and have achieved significant results. M.S. and Ph.D. programs in Ocean Mapping have been approved by the University and recognized by the International Federation of Surveyors/International Hydrographic Organization, and 10 graduate students are enrolled to date. In addition, the Center has developed software tools to read most types of hydrographic data; developed 3-dimensional hydrographic data visualization software; tested the ability of high speed high resolution side scan sonar to deliver bathymetric data; and worked with NOAA to survey Portsmouth Harbor for the Shallow Survey 2001 conference data set. The Center is also supporting NOAA with bathymetric data analysis in connection with potential Law of the Sea continental shelf claims in the Arctic.

Electronic Navigational Charts

The Electronic Navigational Chart (ENC) is perhaps the most anticipated, and most critical component of NOAA's suite of navigation tools. NOAA began developing ENCs in 1994 when new advances in navigation technology foreshadowed the potential for an integrated MTS information infrastructure. To meet the requirements for civilian transportation, the Department of Transportation began implementing Global Positioning System (GPS) augmentations based on a technique known as "differential" GPS (DGPS). Operated by the U.S. Coast Guard for vessel positioning, the maritime DGPS has revolutionized onboard navigation systems to give mariners very precise location data at 10 meters or less. Because more than fifty percent of NOAA's nautical charting data were collected before 1940, in many cases the DGPS position is more accurate than both the surveying technology that gathered the soundings and the traditional nautical chart itself. Depending on scale, the graphical accuracy portrayed on a nautical chart can range from 40 to 100 meters. This is often the cause of the "ship on the pier" situation, where the vessel tied up at the pier appears on the navigation system to be on the pier rather than alongside. NOAA recognized early on that mariners need high-accuracy electronic chart data to fuel their real-time navigation display systems for collision and grounding avoidance and "just-in-time" delivery routing practices. Reaching the same conclusion, the international hydrographic community encourages ENC development by countries. The International Maritime and Hydrographic Organizations, the latter on which NOAA represents the United States, developed performance and data standards to authorize use of Electronic Chart Display and Information Systems instead of paper charts. Commercial mariners in particular embraced these concepts, as requirements to carry and update nautical charts aboard vessels are burdensome and bulky.

At the same time, though, NOAA could not abandon its continuing charting mission to focus exclusively on the new ENC technology. Many mariners still required traditional nautical charts. To meet this need efficiently, NOAA developed a digital database system to update its paper charts more quickly and get accurate data into the hands of users in a more timely fashion. Additionally, the Raster Nautical Chart (RNC) was designed with a private sector cooperative research partner as an interim product that mariners could use while the advanced ENCs were being developed. The raster product has been very successful. Continually maintained using base chart program funding, it has proven to be highly efficient and popular in its own right with the computer-savvy mariner. NOAA and its private sector partner, MapTech, Inc. of

Amesbury, Massachusetts, and Bangor, Maine, have built on RNC technology to develop a weekly electronic Update Service for the RNC, and a new Print On Demand chart that is also updated on a weekly basis, printed with the latest information when ordered, and then mailed to the customer. Though essentially just an electronic picture of the paper chart, and hampered by the same positioning limitations, the RNC has enabled NOAA to improve its navigation products in the short term and provide the public with affordable, accurate and up-to-date navigation information.

The ENC is the next-generation product required to meet the increasingly sophisticated and technological demands of mariners and to ensure safe navigation. Built to international standards, ENCs, also called vector charts, are not charts but rather a database of chart features and digital hydrographic data that can be intelligently processed and displayed by electronic charting systems. As "smart charts," ENCs give the user much more information than the paper chart can, and with much greater accuracy. They can be integrated with GPS satellite data and other sensor information (such as water levels, winds and weather) to significantly improve navigation safety and efficiency by warning the mariner of approaching hazards to navigation and situations where the vessel's current track will take it into danger. The NOAA ENC supports all types of marine navigation by providing the official database for electronic charting systems. The utility of the ENC database extends beyond navigation; for example, it can also support marine geographic information systems for coastal management.

Rather than simply "vectorizing" or digitizing the paper chart, NOAA contracts with the private sector to construct the base ENC, which is then supplemented with more precise data compiled by NOAA for critical chart features such as channels, aids to navigation and obstructions. NOAA's long-standing partnerships with the Coast Guard, the Army Corps of Engineers and numerous other entities generate immense quantities of this high-accuracy source data, which NOAA digests and quality controls before charting. Our partners also anticipate the availability of the ENC to meet their own objectives. For example, NOAA's ENC will integrate with the Coast Guard's Automated Identification System (AIS) to help track and manage vessel movement. The International Maritime Organization has established a 2002 deadline for all new commercial carriers to be fitted for AIS transponders. Existing ships must be retrofitted for AIS transponders by 2005. This international requirement makes it imperative for NOAA to move forward in ENC construction and delivery.

As we testified in 1997, and again in 2000, NOAA has taken an incremental approach to developing the ENC using the limited resources it has available. NOAA's strategy has been to maintain and update its existing chart suite in paper and raster formats while it creates vector ENCs for waters where more detailed data would best promote safe navigation, principally in and around the 40 major U.S. commercial ports. Using this investment-for-benefit strategy, NOAA has built 135 ENCs, and plans to provide a total of 200 by the end of 2002 for the Nation's busiest ports under the current budget request. Ultimately, but only as resources allow, NOAA needs to produce approximately 660 ENCs to correlate with the paper chart suite of 1000 charts in order to respond to the Marine Transportation System's need for full contiguous coverage of U.S. and territory waters. Commercial mariners, as well as electronic chart system manufacturers, have an expectation that NOAA will produce a full suite of ENCs to provide significantly more accurate and up-to-date information that can enhance safety and environmental protection, reduce risks, and improve efficiency.

As of mid-July, NOAA has started releasing ENCs in a provisional form for free download over the Internet. Since the first 63 ENCs were posted, over 10,000 ENC files have been downloaded. This shows a real interest on the part of the public, given that the availability of these files has not been widely advertised, and the downloading traffic has been steady to date. NOAA intends to make the provisional ENCs into official chart products once we can provide periodic updates (sometime after January 2002).

Shoreline Mapping/Geodetic Positioning

The Hydrographic Services Improvement Act of 1998 also authorizes appropriations for NOAA's shoreline mapping and geodetic programs, which support NOAA's nautical charting efforts, the MTS infrastructure, and the Nation's positioning needs. NOAA's shoreline mapping activities provide the accurate, consistent, and up-to-date data required to delineate shoreline for NOAA's nautical products and ENC's. The shoreline depicted represents the official National Shoreline of the United States. NOAA delineates shoreline with stereo photogrammetry using tide-coordinated aerial photography controlled by kinematic GPS techniques. This process produces a seamless, digital database of the National Shoreline. NOAA and its partners are working together to develop new remote sensing techniques to accelerate shoreline mapping, but only about 10 percent of the shoreline has been produced digitally to date. In addition, approximately one-third of the U.S. shoreline has yet to be mapped by NOAA and our partners in a manner that meets NOAA's requirements for tide-controlled surveys for nautical charting (primarily areas in Alaska, the Great Lakes, and the West Coast north of Santa Barbara, California). Much of what has been mapped was done prior to 1970, and the accuracy, consistency, and currency of these areas of the coastline cannot be warranted. America's 95,000 miles of coastline are subject to natural and man-made processes that continually alter its shape and character. The National Shoreline should be frequently evaluated, especially in this era of rapid coastal development.

NOAA has determined that, in order to adequately maintain the National Shoreline, it must place critical portions of the coastline on a 5-year average cycle to resurvey and map, with remaining areas mapped on a 10-year average cycle. An area is determined to be critical based upon the level of economic activity, the potential for alteration, and its environmental sensitivity. At the present rate of progress, NOAA maintains the existing shoreline data on a 50-year cycle and cannot address the one-third that has yet to be mapped. This is not sufficient to keep pace with the needs of ENC's and the growing stress on the Marine Transportation System.

NOAA received a \$1.5 million increase for shoreline mapping in FY 2001. In line with its commitment to increase the opportunities for private sector performance for routine data acquisition and processing when appropriate, NOAA is in the process of contracting for shoreline in the Gulf Coast and Alaska in support of hydrographic surveying. NOAA intends to open up all future increases in shoreline mapping and will begin to submit its current in-house operations in the gathering of shoreline data to competition with the private sector, in accordance with the Administration's Competitive Sourcing Initiative. We have held workshops and meetings with relevant private sector entities to inform them and work through issues in advance. Knowledge gained from these activities has helped us devise a strategy for photogrammetric and remote sensing services related to shoreline mapping. We believe this strategy alleviates the need for a report to Congress, as directed in the proposed draft reauthorization measure provided to us. Using experience gained from its hydrographic program as a model, NOAA will maintain core surveying management competency but will also compete with the private sector and develop opportunities to build private sector capability in photogrammetric mapping to NOAA standards. GPS-positioned shoreline provides the high accuracy needed for ENC's. Other new products that the private sector could produce, such as large-scale docking charts, would also rely on NOAA's digital shoreline database.

Over the years NOAA's photogrammetric techniques have also been applied to other environmental problems dealing with the coastal zone. For example, the program has produced boundary maps for government agencies and legal authorities for use in the adjudication of marine boundary disputes among Federal, state, and private litigants. Storm evacuation maps have been used by government and disaster

relief agencies for planning emergency evacuation of affected inhabitants from coastal areas subject to flooding by severe storms and hurricanes. NOAA has also provided imagery to disaster relief agencies to assist in rapid response storm damage assessment. Coastal zone managers, planners, scientists, and regulatory agencies use the coastal zone maps prepared by NOAA to assess marshlands, marine sanctuaries and other coastal areas subject to multiple use.

Another crucial part of NOAA's mandate is management of the National Spatial Reference System (NSRS), which provides a common geographic framework and the foundation for the Nation's spatial data infrastructure. NSRS provides the basis for mapping, charting, navigation, boundary determination, property delineation, infrastructure development, resource evaluation surveys, and scientific applications; in other words, it is the underlying reference system that provides positioning consistency for the entire United States. NOAA is enhancing NSRS to complement the Global Positioning System and give more integrity to GPS coordinates. The mainstay of NSRS is the nationwide network of Continuously Operating Reference Stations (National CORS). NOAA supplies data from over 200 National CORS sites through cooperative agreements with academic, commercial, government, and private organizations.

The U.S. Coast Guard's maritime DGPS network is a major contributor to the National CORS. NOAA also provides integrity monitoring for the Coast Guard DGPS sites to help ensure the system's reliability. The Department of Transportation is currently expanding the maritime DGPS network into the Nationwide Differential GPS (NDGPS) network. NDGPS allows the marine navigator to determine vessel location and the National CORS system allows the creation of charts specifying water depth beneath the vessel and the distance from the vessel to a docking site or an obstruction. NDGPS provides data to be used instantaneously for positioning within a few meters. National CORS provides a framework from which users extract data for more precise applications; surveyors, engineers, GIS professionals, and others may use CORS data via the Internet to compute 3-dimensional positions with an accuracy of a few centimeters. Over 90 percent of the conterminous United States is within 200 kilometers of at least one National CORS. It is NOAA's goal to have the entire U.S. within 200 kilometers of three National CORS in order to provide higher positioning accuracies and capabilities. NOAA is also working on techniques for highly accurate positioning with GPS in real time, so that mariners may make better decisions for operating their vessels safely. With this expanded capability, port managers and shippers have the opportunity to safely maximize capacity.

In the words of one GPS equipment manufacturing executive, 'Accuracy is Addictive.' The need for more accurate, timely, and consistent positioning services causes the NSRS to continually evolve in anticipation of meeting these burgeoning demands. One such effort particularly relevant to marine transportation safety is Height Modernization, a set of NOAA-led efforts to enhance the vertical component of NSRS by providing better access to accurate, reliable, real-time height data. NOAA prepared a report on Height Modernization for this Subcommittee in 1998. This vertical accuracy is important because, for example, knowing underkeel clearance (or the vertical distance between a ship's bottom and the channel floor) minimizes the risk of groundings, environmental damage and time spent waiting on high tides to enter or leave a port. Knowing more precisely where a vessel is helps the mariner to maximize use of limited channel depths safely in changing weather and water conditions. Collisions with bridges can be avoided if mariners have height information to navigate precisely and know in real-time the air gap between the bridge and the vessel. Preventing such incidents has an important effect on port capacity because a maritime accident can close down a port, delay and reroute other vessels, trains and road traffic, and cost millions of dollars, especially if the accident results in a hazardous spill. A recent example is the lift bridge struck by a grain freighter in the Great Lakes between Lake Ontario and Lake Erie. This accident had the potential to

block the St. Lawrence Seaway to both U.S. and Canadian marine traffic for several days while clean-up took place, causing expensive delays for other vessels moving freight through this major marine trade link.

In order to implement Height Modernization, NOAA engages in a variety of partnerships with the private sector, state and local governments, and other Federal agencies. Many of these partnerships provide geodetic control and access to NSRS, as well as development and implementation of geodetic applications. NOAA is currently assisting the states of California and North and South Carolina with targeted funding, guidance and coordination. The intent is to have these serve as prototype arrangements for implementing Height Modernization nationwide. In fact, as directed in the pre-conference House 2002 Appropriations Bill, NOAA has moved forward on addressing a report request to work with Louisiana and Wisconsin to assess these states' geodetic program needs. NOAA held listening sessions in mid-August and we plan to produce our report by the specified deadline of September 15, 2001, for Conference action.

National Water Level Observation Network/Physical Oceanographic Real-time Systems

Real-time water levels, tides and currents are an important tool in NOAA's suite of services to support safe and efficient use of a port. The Physical Oceanographic Real-Time System, or PORTS, has received Congressional attention in recent years, but the network of water level stations that underpins PORTS is perhaps less well known. The National Water Level Observation Network (NWLON) consists of approximately 175 continuously operating water level measurement stations distributed along U.S. coasts, in the Great Lakes and connecting channels, and in the U.S. territories and possessions. NWLON provides basic tidal datums to determine U.S. coastal marine boundaries and for nautical chart datums and long term sea level change. It also provides support for NOAA's tsunami and storm surge warning programs, climate monitoring, coastal processes and tectonic research. In the Great Lakes, water level stations support water management and regulation, navigation and charting, river and harbor improvement, power generation, scientific studies and adjustment for vertical movement of the Earth's crust in the Great Lakes Basin.

Although the NWLON stations have now been modernized with a real-time data dissemination system developed in the 1980's, NOAA has been unable to revisit stations to perform routine maintenance. This has caused some stations to fail, and data from others is suspect. A recent comprehensive assessment of NOAA's tidal current prediction products shows major gaps and deficiencies for the Nation's ports and harbors due in part to this station degradation. NOAA needs to restore failing stations to operational status, collect current meter data at historical locations and at new locations critical to the mariner. The new data will be used in the design of future PORTS and in the calibration and validation of hydrodynamic models for development of nowcast/forecast products of water conditions critical for supporting increasing marine commerce and safe navigation.

NOAA is working with regional and local partners to expand the water levels observation network and PORTS in major U.S. ports. PORTS is a decision support tool which integrates and delivers real-time oceanographic data -- water levels, currents, winds and water temperature, forecasts and other geospatial information -- to users via the telephone, fax, and Internet. There are currently five large PORTS (Tampa, New York, San Francisco, Narragansett Bay and Houston/Galveston), and several smaller single station real-time systems (Chesapeake Bay, New Haven, Soo Locks, Tacoma, Seattle, Anchorage, Nikiski). Emphasis is now being placed on implementing real-time data dissemination of automatically quality-controlled data from the entire NWLON. Many ports have expressed interest in partnering with NOAA to obtain their own PORTS, including Los Angeles/Long Beach, Charleston, New Orleans, and Jacksonville, Florida, among others. Local authorities fund and maintain the PORTS equipment, and NOAA assists with installation and quality assurance. NOAA has developed and implemented a quality control capability

called the Continuous Operational Real-Time Monitoring System (CORMS) to provide a centralized capability to quality control the real-time data. This capability will ensure that mariners and other users have accurate data upon which to confidently base critical operational decisions that can affect life and property.

PORTS can tie into a vessel traffic system to help move ships in and out of port as quickly as possible, and as fully loaded as is safely possible. Underkeel clearance, of course, is again a key aspect of this. A few more inches of draft can mean additional thousands to millions of dollars to a shipper. It may take anywhere from two to eight hours for a ship to leave a port and reach the ocean, and, of course, it can take many hours to load additional cargo. To maximize cargo loads, mariners need to know what the underkeel clearance will be from 6 to 24 hours into the future. This takes forecast models combined with real-time oceanographic systems and up-to-date nautical charts. NOAA is doing research into forecast models and new visibility and air gap sensors tied to PORTS; in fact, the Chesapeake Bay Forecast Model just recently became operational to provide the maritime community with improved predictions of water levels in the Chesapeake Bay. Ships coming into port will use these sensors and models to time arrivals for the best underkeel clearance situation and not have to wait outside the bay or port entrance, wasting fuel. Knowing more exactly where a vessel sits in the water column also reduces the need for deeper safety-margin dredging.

NOAA continues to hear from the navigation community that the need for PORTS data is a high priority. The 1999 MTS Assessment also recommended expanding PORTS technology for maximum safety and efficiency in waterways management. Many members of Congress are aware of the utility of NOAA's real-time water level systems. In 2000 NOAA sought, and appropriators granted, permission to reprogram funds to keep PORTS operational and to activate Narragansett Bay. FY 2001 funding enabled NOAA to maintain support for the existing PORTS and implement the prototype CORMS. The current 2002 budget before Congress would add needed flexibility to the program; this level of funding will help maintain and upgrade the NWLON and allow NOAA to provide quality assurance services for an expanded network of PORTS.

The Future: A new Hydrographic Services Improvement Act

Maritime shipping is the cheapest and most environmentally responsible method of transportation. For many bulk products, from oil to farm goods, there is no alternative transportation means. NOAA provides tools to maximize the capacity of American ports while safeguarding the environment. NOAA's navigation services can increase the efficiency of a port's throughput, and they help the coastal manager make informed decisions on development and resources. With better information about bathymetry, water levels, currents, positioning and obstructions, larger vessels can enter U.S. harbors and carry more cargo for export, and every inch matters.

NOAA is an active participant in the MTS Initiative, and it is our hope that a reauthorized Hydrographic Services Improvement Act will allow NOAA to fully implement the integrated suite of services sought by users of the MTS. NOAA's programs also support the National Energy Policy by supporting safe waterborne transport of energy products and national security objectives. To help achieve the world's most technologically advanced, safe, efficient, globally competitive and environmentally responsible system for moving goods and people, NOAA must continue efforts to modernize its navigation services programs and get its data into the hands of mariners and other users. Private sector and fellow MTS agency partnerships are key to our collective success in improving the MTS infrastructure.

I am pleased to report that significant headway is being made on the critical backlog, and that NOAA is taking a look at strategies for surveying other Navigationally Significant areas. Contracting for hydrographic surveys is progressing very well. NOAA is satisfied with the overall quality of the data generated by its

contractors. The letter of invitation inquires why NOAA was unable to develop a meaningful plan to maintain expertise in hydrography and asks whether it is still necessary for NOAA to maintain expertise. NOAA did submit the report, the Hydrographic Expertise Report to Congress in FY 2001. This report, combined with the plan submitted to Congress five years ago, explains NOAA's basic strategy at that time to 1) use government vessels, 2) increase contracting, 3) pursue a third option of leasing vessels, and 4) work with the private sector and other agencies in the research and development of technologies. NOAA will continue to work on ways to maintain expertise in the management of hydrographic surveying, and ensure that the work is done in the most efficient and reliable way possible and in accordance with Administration policy on competitive sourcing.

The Hydrographic Services Improvement Act has been an effective mechanism to begin addressing the survey backlog, and now NOAA should turn its attention to fully modernizing the rest of the navigation services program to handle the incoming hydrographic data and get this critical information out to the mariner in a timely fashion. Some changes that NOAA would like to see in a reauthorized Act include increased flexibility to work with the private sector, non-governmental and volunteer organizations to fulfill this mission. Authority to increase public awareness on the availability of hydrographic services would also help improve public safety and expand the community of NOAA data users to more environmental groups. Clarifying that NOAA provides basic data for environmental applications as well as engineering and scientific purposes would simply encourage additional uses of this data not foreseen in 1947. Finally, new authorization levels should reflect the costs to implement new technologies in modernizing NOAA's navigation programs, maintain and update charting and associated databases, and provide high-accuracy data and services in the real-time, digital formats demanded by our users. We request that the draft reauthorization levels be consistent with the President's Budget. The Department's draft bill will address the appropriate levels.

An unintended consequence of the draft authorization is that it would nullify the permanent authorization of the programs provided by the Coast and Geodetic Survey Act of 1947. NOAA's navigation programs are perpetual infrastructure needs for the safety of the Marine Transportation System and should remain permanently authorized. They should not be subject to accidental de-authorization in the event that Congress is delayed in acting on a programmatic reauthorization. As I stated earlier, limits on NOAA's authority to operate its hydrographic ships without multi-beam equipment are overly specific. We fully support authorizing NOAA's use of modern equipment, but limitation on authority is unnecessary. The draft legislation also inadvertently restores language that limited NOAA's authority to perform navigation services to U.S. waters; this language was changed in 1960 (Pub.L. 86-409) and reiterated most recently during the 106th Congress with HR 1000, Title VI, Section 605 (Pub. L. 106-181), to clarify NOAA's ability to operate outside of U.S. waters.

In closing, I would like to reiterate our focus on the ENC, the electronic navigational charts which will integrate all of NOAA's core products -- new and accurate hydrographic and shoreline data, precise positioning information, and real-time oceanographic data -- to enhance situational awareness and help the mariner utilize water depths more safely and effectively for navigation and cargo movement, in all weather conditions. As MTS trade and congestion increase, mariners will need to be able to navigate in more crowded, low visibility situations to keep traffic flowing. The impact of weather delays on cargo delivery has ripple effects throughout our economy; Houston Ship Channel is an excellent example of this. Home to some of the Nation's largest petrochemical facilities, this port is shut down by heavy fog each winter as ships sit waiting for better weather to transit the channel. Delays in energy delivery translate into higher fuel prices for consumers. The ability to navigate with the ENC in low visibility would help reduce this backlog

of ships awaiting passage and improve vessel traffic management.

An initial set of ENC's is now available in prototype format via the Internet and NOAA continues to maintain and update the raster nautical charting database. The shoreline mapping program will expand its contracting efforts this year to acquire more digital shoreline data, and model arrangements with key states will help NOAA initiate Height Modernization of the Nation's spatial reference system. Finally, we are optimistic that the 2002 budget now pending before Congress will enable us to put the ENC on track, as well as adequately maintain the NWLON and PORTS systems, to support the Nation's need for high-accuracy products to promote safe navigation.

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